## WHAT IS CLAIMED IS:

1	1. A method of encoding data for transmission from a source to a
2	destination over a communications channel, the method comprising:
3	generating a plurality of redundant symbols from an ordered set of input
4	symbols to be transmitted; and
5	generating a plurality of output symbols from a combined set of symbols
6	including the input symbols and the redundant symbols, wherein the number of possible
7	output symbols is much larger than the number of symbols in the combined set of symbols,
8	wherein at least one output symbol is generated from more than one symbol in the combined
9	set of symbols and from less than all of the symbols in the combined set of symbols, such that
10	the ordered set of input symbols can be regenerated to a desired degree of accuracy from any
11	predetermined number, N, of the output symbols.
1	2. The method of claim 1, further comprising transmitting the plurality of
2	output symbols over a communications channel.
2	output symbols over a communications enamer.
1	3. The method of claim 1, further comprising storing the plurality of
2	output symbols on a storage media.
1	4. The method of claim 1, wherein N is greater than the number of input
2	symbols in the ordered set of input symbols.
2	symbols in the ordered set of input symbols.
1	5. The method of claim 1, wherein N is less than or equal to the number
2	of input symbols in the ordered set of input symbols.
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2	6. The method of claim 1, further comprising determining a number R of
2	redundant symbols to generate based on the number K of input symbols in the ordered set of
3	input symbols.
1	7. The method of claim 6, wherein K is an estimate of the number of
2	input symbols.
1	7 The method of claim 1 wherein the alreadity of and and are arready to 1
1	8. The method of claim 1, wherein the plurality of redundant symbols is
2	generated according to a LDPC code.

1	9. The method of claim 1, wherein the plurality of redundant symbols
2	includes a plurality of first redundant symbols and a plurality of second redundant symbols,
3	and wherein the step of generating the plurality of redundant symbols comprises:
4	generating the plurality of first redundant symbols from the input symbols;
5	and
6	generating the plurality of second redundant symbols from the first redundant
7	symbols and the input symbols.
1	10. The method of claim 9, wherein the plurality of first redundant
2	symbols is generated according to a Hamming code, and wherein the plurality of second
3	redundant symbols is generated according to a LDPC code.
1	11. The method of claim 10, further comprising:
2	determining a number D+1 of first redundant symbols based on the number K
3	of input symbols in the ordered set of input symbols; and
4	determining a number E of second redundant symbols based on a number R of
5	redundant symbols to generate and D+1.
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1	12. The method of claim 11, further comprising determining R based on K.
1	13. The method of claim 11, wherein K is an estimate of the number of
2	input symbols.
1	14. The method of claim 11, wherein D is a smallest integer such that 2D –
2	D-1 >= K, and wherein $E = R - D - 1$ .
1	15. The method of claim 1, wherein the desired accuracy is complete
2	recovery of the input symbols.
_	receivery of the input symbols.
1	16. The method of claim 1, wherein the desired accuracy is complete
2	recovery of the input symbols with a high probability.
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1	17. The method of claim 1, wherein the desired accuracy is recovery of G
2	input symbols, wherein G is less than the number of input symbols in the ordered set of input
3	symbols.

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1	18. The method of claim 1, wherein at most G input symbols can be
2	regenerated from any number of output symbols, wherein G is less than the number of input
3	symbols in the ordered set of input symbols.
1	19. The method of claim 1, wherein generating a plurality of redundant
1	19. The method of claim 1, wherein generating a plurality of redundant symbols includes, for each redundant symbol:
2	,
3	determining t distinct input symbols according to a distribution; and
4	computing each redundant symbol as the XOR of the t distinct input symbols.
1	20. The method of claim 19, wherein t is the same for all redundant
2	symbols.
1	21. The method of claim 20, wherein t is the smallest odd integer larger
2	than K/2, wherein K is the number of input symbols in the ordered set of input symbols.
1	22. The method of claim 19, wherein the distribution is a uniform
2	distribution.
1	23. The method of claim 1, further comprising transmitting the plurality of
2	output symbols over a communications channel, wherein the step of generating the plurality
3	of output symbols is performed substantially concurrently with the step of transmitting the
4	plurality of output symbols.
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1	24. The method of claim 23, wherein the step of generating the plurality of
2	redundant symbols is performed substantially concurrently with the step of transmitting the
3	plurality of output symbols.
1	25. The method of claim 23, wherein the step of generating the plurality of
2	redundant symbols is performed in advance of the step of transmitting the plurality of output
3	symbols.
1	26. The method of claim 1, wherein the step of generating the plurality of
2	output symbols is performed using a first device, and wherein the step of generating the
3	plurality of redundant symbols is performed using a second device separate from the first
4	device.

1	27. A system for encoding data for transmission from a source to a
2	destination over a communications channel, the system comprising:
3	a static encoder coupled to receive a plurality of input symbols, the plurality of
4	input symbols generated from data to be transmitted, the static encoder including a redundant
5	symbol generator that generates a plurality of redundant symbols based on the input symbols;
6	and
7	a dynamic encoder coupled to receive the plurality of input symbols and the
8	plurality of redundant symbols, the dynamic encoder including an output symbol generator
9	that generates a plurality of output symbols from a combined set of symbols including the
0	plurality of input symbols and the plurality of redundant symbols, wherein the number of
1	possible output symbols is much larger than the number of symbols in the combined set,
2	wherein at least one output symbol is generated from more than symbol from the combined
3	set and from less than all of the symbols in the combined set, such that the ordered set of
4	input symbols can be regenerated to a desired degree of accuracy from any predetermined
5	number, N, of the output symbols.
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1	28. The system of claim 27, wherein N is greater than the number of input
2	symbols in the ordered set of input symbols.
1	29. The system of claim 27, wherein N is less than or equal to the number
2	of input symbols in the ordered set of input symbols.
1	30. The system of claim 27, further comprising a transmit module, coupled
2	to the dynamic encoder and to a communications channel, that receives the output symbols
3	and transmits the output symbols over the communications channel.
1	31. The system of claim 27, further comprising a key generator, coupled to
2	the dynamic encoder, that generates a key for each output symbol to be generated, wherein
3	the dynamic encoder is coupled to receive each key, and wherein the dynamic encoder
4	generates each output symbol based on the corresponding key.
1	32. The system of claim 27, further comprising a key generator, coupled to
2	the static encoder, that generates a key for each of at least some of the redundant symbols to
3	he generated wherein the static encoder is counted to receive each key, and wherein the static

4	encoder generates each of the at least some redundant symbols based on the corresponding
5	key.
1 2	33. The system of claim 27, wherein the static encoder includes a LDPC encoder.
1	34. The system of claim 27, wherein the static encoder further comprises a
2	first static encoder having a first redundant symbol generator, and a second static encoder
3	having a second redundant symbol generator;
4	wherein the plurality of redundant symbols includes a first plurality of
5	redundant symbols and a
6	a second plurality of redundant symbols;
7	wherein the first redundant symbol generator generates the first plurality of
8	redundant symbols based on the input symbols; and
9	wherein the second redundant symbol generator generates the second plurality
10	of redundant symbols based on the input symbols and the first plurality of redundant
11	symbols.
1	35. The system of claim 34, wherein the first static encoder includes a
2	Hamming encoder, and wherein the second static encoder includes a LDPC encoder.
1	36. A method of receiving data transmitted from a source over a
2	communications channel, the method comprising:
3	receiving output symbols, wherein each output symbol is generated from at
4	least one symbol in a combined set of input symbols and redundant symbols, wherein at least
5	one output symbol is generated from more than one symbol in the combined set and less than
6	all of the symbols in the combined set, wherein the number of possible output symbols is
7	much larger than the number of symbols in the combined set, wherein the input symbols are
8	from an ordered set of input symbols, wherein the redundant symbols are generated from the
9	input symbols;
10	upon receiving at least a subset of the output symbols, regenerating at least a
11	subset of the symbols in the combined set from the output symbols, the subset of the symbols
12	in the combined set including a plurality of regenerated input symbols and a plurality of
13	regenerated redundant symbols;
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14	if the step of regenerating at least a subset of the symbols from the N output
15	symbols does not regenerate the input symbols to a desired degree of accuracy, regenerating
16	at least some of unregenerated input symbols from the plurality of regenerated redundant
17	symbols and the plurality of regenerated input symbols.
1	37. The method of claim 36, wherein the redundant symbols include a first
2	plurality of redundant symbols and a second plurality of redundant symbols, wherein the step
3	of regenerating at least some of the unregenerated input symbols includes:
4	regenerating, from the regenerated redundant symbols of the first plurality of
5	redundant symbols and the plurality of regenerated input symbols, at least one of the
6	unregenerated input symbols and unregenerated redundant symbols of the second plurality of
7	redundant symbols; and
8	if the step of regenerating from the regenerated redundant symbols of the first
9	plurality of redundant symbols and the plurality of regenerated input symbols does not
10	regenerate the input symbols to a desired degree of accuracy, regenerating at least one
l 1	unregenerated input symbol from redundant symbols of the second plurality of redundant
12	symbols and the plurality of decoded input symbols.
1	38. The method of claim 37, wherein some of the unregenerated input
2	symbols and unregenerated redundant symbols of the second plurality of redundant symbols
3	is regenerated using an LDPC decoder; and
4	wherein the some input symbol is regenerated from redundant symbols of the
5	second plurality of redundant symbols using a Hamming decoder.
1	39. The method of claim 36, wherein the step of regenerating at least some
2	of unregenerated input symbols includes regenerating all of the unregenerated input symbols.
1	40. The method of claim 36, wherein the step of regenerating at least the
2	subset of the symbols in the combined set and the step of regenerating at least some of
3	unregenerated input symbols include:
4	forming a first matrix that indicates, for each received output symbol, the
5	symbols in the combined set associated with the output symbol;
6	augmenting the first matrix with information that indicates, for each redundant
7	symbol, the input symbols associated with the redundant symbol; and

8	regenerating at least some of the input symbols as a solution to a system of
9	equations indicated by the augmented first matrix.
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1	41. The method of claim 36, wherein N is greater than or equal to the
2	number of input symbols.
1	42. The method of claim 36, wherein N is smaller than the number of input
2	symbols.
1	43. The method of claim \$6, wherein regenerating at least some of
2	unregenerated input symbols includes regenerating all of the input symbols.
1	44. The method of claim 36, wherein regenerating at least some of
2	unregenerated input symbols includes regenerating less than all of the input symbols.
1	45. A system for refeiving data transmitted from a source over a
2	communications channel, the system comprising:
3	a receive module coupled to a communications channel for receiving output
4	symbols transmitted over the communications channel, wherein each output symbol is
5	generated from at least one symbol in a combined set of input symbols and redundant
6	symbols, wherein at least one output symbol is generated from more than one symbol in the
7	combined set and less than all of the symbols in the combined set, wherein the number of
8	possible output symbols is much larger than the number of symbols in the combined set,
9	wherein the input symbols are from an ordered set of input symbols, wherein the redundant
10	symbols are generated from the input symbols;
l 1	a dynamic decoder that, upon receiving at leas a subset of the output symbols,
12	decodes a subset of the symbols in the combined set from the output symbols, the subset of
13	the symbols in the combined set including a plurality of decoded input symbols and a
14	plurality of decoded redundant symbols; and
15	a static decoder that decodes at least some of undecoded input symbols, if any,
16	from the plurality of decoded redundant symbols.
1	46. The system of claim 45, wherein the static decoder includes a LDPC
2	decoder

1	47. The system of claim 45, wherein the redundant symbols include a first
2	plurality of redundant symbols and a second plurality of redundant symbols, wherein the
3	static encoder includes:
4	a first static decoder that decodes, from the decoded redundant symbols of the
5	first plurality of redundant symbols and the plurality of decoded input symbols, at least one of
6	the undecoded input symbols and undecoded redundant symbols of the second plurality of
7	redundant symbols; and
8	a second static decoder that decodes at least one undecoded input symbol from
9	redundant symbols of the second plurality of redundant symbols and the plurality of decoded
10	input symbols.
1	48. The system of claim/47, wherein the first static decoder includes a
2	LDPC decoder, and wherein the second static decoder includes a Hamming decoder.
1	49. The system of claim 45, wherein the dynamic decoder includes a
2	processor configured to perform the steps of:
3	forming a first matrix that indicates, for each received output symbol, the
4	symbols in the combined set associated with the output symbol;
5	augmenting the first/matrix with information that indicates, for each redundant
6	symbol, the input symbols associated with the redundant symbol; and
7	1
	regenerating at least some of the input symbols as a solution to a system of
8	equations indicated by the augmented first matrix.
1	50. A computer data signal embodied in a carrier wave comprising:
2	a plurality of output symbols, wherein the plurality of output symbols
3	represents symbols generated from a combined set of symbols including an ordered set of
4	input symbols and the redundant symbols, wherein the redundant symbols are generated from
5	the input symbols, wherein the number of possible output symbols is much larger than the
6	number of symbols in the combined set of symbols, wherein at least one output symbol is
7	generated from more than one symbol in the combined set of symbols and from less than all
8	of the symbols in the combined set of symbols;
9	such that a receiver of the data signal can regenerate the ordered set of input
10	symbols to a desired degree of accuracy from any predetermined number, N, of the output
11	symbols.

1	51. The method of claim 36, wherein the step of regenerating at least a
2	subset of the symbols is performed upon receiving a predetermined number N of any of the
3	output symbols.
1	52. The method of claim 36/wherein the step of regenerating at least a
2	subset of the symbols is performed upon receiving a number N of any of the output symbols,
3	wherein N is such that the input symbols can be regenerated to a desired accuracy.
1	53. The method of claim 36, wherein the step of regenerating at least a
2	subset of the symbols is performed substantially concurrently with receiving the output
3	symbols.